

REMARKS

The Final Office Action mailed July 24, 2008 has been carefully considered. Reconsideration in view of the following remarks is respectfully requested.

Amendment to Claims 1, 4, 5, and 11-13

Claims 1, 4, 5, and 11-13 have been amended for improved clarity and to more fully define what the Applicant considers to be his invention. Applicant believes that the amendment does not raise any issues beyond those already considered by the Examiner.

Rejection of claims 11 and 12 Under 35 U.S.C. § 112, First Paragraph

Claims 11 and 12 were rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. With respect to claim 11, the Examiner states that the limitation of “a concentration of the chloride of the metal in pure hydrochloric acid is less than 5%” is not supported by the specification, and in addition, “it is not clear how the chloride of the metal is defined.” (Office Action p. 2.) However, the Applicant directs the Examiner’s attention to paragraph 0040 of the specification, which states, “Further, preferably, the concentration of gold or platinum chloride in the pure hydrochloric acid is less than 5%.” This language in the specification, and the surrounding context and the specification as a whole, are sufficient to convey to one of skill in the art that the Applicant had possession of the claimed invention at the time the application was filed.

In addition, the definition of a “metal chloride” in amended claim 11 (and amended claim 1 as well) is known in the art, is clear, and is used consistently in the application. The term “metal chloride” is intended to have the meaning generally ascribed to that term in the art, and in general, a metal chloride is known in the art as a chemical compound having a formula M_xCl_y , where M is the chemical symbol for the metal. The term “metal chloride” is used throughout the literature, including in *De Nobel*.

The Examiner does not specifically address why claim 12 is contended to be insufficient under the written description requirement; however, Applicants would like to direct the Examiner’s attention to paragraph 0048, which states, “After chemical etching, the sample is rinsed (for example twice) in preferably pure hydrochloric acid then dried directly.” This is direct support for claim 12, which requires that the “material is rinsed in pure hydrochloric acid after chemically etching the surface.” Thus, there is language in the specification, and the

surrounding context and the specification as a whole, which is sufficient to convey to one of skill in the art that the Applicant had possession of the claimed invention at the time the application was filed.

Therefore, Applicant asserts that one of skill in the relevant art would understand that the Applicant had possession of the invention in claims 11 and 12 at the time of filing the application, and Applicant therefore respectfully requests withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

Rejection of claims 12 and 13 Under 35 U.S.C. § 112, Second Paragraph

Claims 12 and 13 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. With respect to claim 12, the Examiner states that “the material” and “the surface” lack antecedent basis, and “it is not clear which material is rinsed in pure hydrochloric acid after which surface is chemically etched.” (Office Action, p. 3.) With respect to claim 13, the Examiner states that “the material” lacks antecedent basis, and it “is not clear which material is rinsed.” (Office Action, p. 3.)

Claims 12 and 13 have been amended to refer to “the II-VI semiconducting material or the compound of the II-VI semiconducting material,” which has antecedent basis. Therefore, withdrawal of the rejection under 35 U.S.C. § 112, second paragraph, is therefore requested.

Rejection of Claims 1-4, 7-8, and 11 Under 35 U.S.C. § 102 and Alternatively 103(a)

Claims 1-4, 7-8, and 11 were rejected under 35 U.S.C. § 102(b) and § 103(a) as allegedly being anticipated by *D De Nobel* (U.S. pat. no. 2,865,793). Alternatively, they are rejected under 35 U.S.C. § 103(a) as allegedly being obvious over *De Nobel*. Independent claim 1, as amended, requires the limitation that “the at least one electrode is formed by electrochemical deposition of the metal from a solution of a metal chloride in pure hydrochloric acid, the metal chloride being a chloride of said metal, wherein pure hydrochloric acid is the liquid which is obtained by dissolving about 37% to about 38% by weight of hydrochloride gas molecules in water.”

However, the Examiner states that *De Nobel* discloses a method in which “the at least one electrode is formed by electrochemical deposition of the metal from a solution of a chloride of the metal in pure hydrochloric acid.” (Office Action at 4.) According to the Examiner, the hydrochloric acid of *De Nobel* would be “inherently pure—containing no contaminant or device

would be degraded.” (Office Action at 4.) In addition, the Examiner states that the choice of 37% to 38% of hydrochloride gas in water is “considered to involve routine optimization,” and therefore is obvious.

Respectfully, however, *De Nobel* does *not* disclose the use of pure hydrochloric acid, either within the range 37% to 38% as defined in the claim, or any other similar range. Rather, De Nobel only discloses the use of dilute hydrochloric acid *solutions*, ranging in concentration from 0% to about 20% of pure hydrochloric acid (by weight). See, for example, col. 1, ll. 60-61 (“acidified or not, even to a HCL-content of 20%”); col. 2, ll. 20-21 (“even if it is acidified to for example 20% of hydrochloric acid”); col. 2, ll. 29-30 (“acidified to 20% of hydrochloric acid or not acidified”). In no case does *De Nobel* disclose a method in which pure hydrochloric acid is used, or even a *solution* of a hydrochloric acid in which the concentration of HCl is greater than 20%. The difference between pure hydrochloric acid, and solutions of hydrochloric acid is well known in the art. “Pure” hydrochloric acid does not merely mean HCl “containing no contaminant”; rather, it means the liquid which is obtained by dissolving about 37% to about 38% by weight of hydrogen chloride gas molecules in water.

It will be appreciated that, according to the M.P.E.P., a claim is anticipated under 35 U.S.C. § 102 only if each and every claim element is found, either expressly or inherently described, in a single prior art reference.¹ *De Nobel* does not disclose the use of pure hydrochloric acid. Therefore, since *De Nobel* does not disclose a method that uses pure hydrochloric acid, *De Nobel* cannot anticipate claim 1 or its dependent claims under 35 USC 102.

Moreover, Applicant respectfully disagrees with the Examiner that the use of pure hydrochloric acid is just a “routine optimization” based on *De Nobel*, or one of skill in the art might find it obvious to extrapolate from the dilute hydrochloric acid *solutions* disclosed in *De Nobel* to the pure hydrochloric acid of the present inventions. The Examiner cites *In re Aller*, 105 U.S.P.Q. 233, 255 (CCPA 1955), which states that “changes such as [concentration] may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art.”

For claim 1, the possibility and benefits of using pure hydrochloric acid is an unexpected result in view of *De Nobel*, as evidenced by the fact that in *De Nobel*, a concentration of 20%

¹ Manual of Patent Examining Procedure (MPEP) § 2131. See also *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

(well below the concentration of pure HCl) is viewed as an extreme, as indicated by the phrases “even if” (col. 2, ll. 19–21), “acidified or not, even to a HCL-content of 20%” (col. 1, ll. 60), and “acidified to 20% of hydrochloric acid or not acidified” (col. 2, ll. 29–30). *De Nobel* does not contemplate that a concentrated solution of hydrochloric acid (greater than 20%) would be used, and certainly does not contemplate that *pure* hydrochloric acid would be used.

The use of dilute hydrochloric acid in the present inventions is qualitatively different than the use of dilute hydrochloric acid solutions. In fact, *De Nobel* teaches that the use of *solutions* of HCl up to 20% is not qualitatively different from using no acid at all (col. 1, l. 61 and col. 2, ll. 19-21, 29-31), and does not mention or teach anything about the qualitative benefits of using pure hydrochloric acid. Thus, the use of pure hydrochloric acid is not a mere optimization. *De Nobel* teaches one of skill in the art that *any* concentration of HCl has no benefit, even as high as 20%, and there is no motivation or teaching disclosed in *De Nobel* that would indicate to one of skill in the art that pure hydrochloric acid would be beneficial, or would even be possible.

There are unexpected and qualitatively different advantages to the use of pure hydrochloric acid: *De Nobel* discloses metal salt concentrations in the range 0.5-50% as “yield[ing] the same results” when used with the disclosed dilute solutions of HCl (col. 1, ll. 54-60). *De Nobel*, however, does not address the affect of metal chloride concentration in the presence of pure hydrochloric acid. In the presence of pure hydrochloric acid, there is an unexpected advantage to using lower concentrations of metal choride, such as less than 5% (Application para. 0040) or less than 1% (*id.*, para. 0050). This is because in pure hydrochloric acid, deposition kinetics are important for a final result (*id.*, para. 0050) which means, among other things, that the electrodes are able to have a larger thickness and better adhesion onto the material than in the prior art. (*id.*, para. 0038). The use of pure hydrochloric acid makes the use of low metal concentrations more advantageous than the use of high metal concentrations. Because the deposited metals such as gold may be expensive, there is a commercial need for processes favoring low metal chloride concentrations (*id.* para 0058). *De Nobel* and the other prior art do not disclose this unexpected advantage of the present inventions.

Furthermore, *De Nobel* does not address the effect of pure hydrochloric acid on the creation of thicker deposition coatings on the order of about 100 nm or more. If the method of *De Nobel* and other prior art is used for metals such as gold and platinum, the result is low deposition thickness on the order of 50 nm and/or low adhesion (*id.*, para 0027, 0028).

However, an unexpected advantage of using pure hydrochloric acid in conjunction with the other limitations of claim 1 is that depositions may be producing having a thicker layer such as layers on the order of 100 nm to 150 nm or greater, and with greater adhesion such that it can withstand a larger peeling force on the order of 10 kg/cm² or more (*id.*, para 0045). These advantages of using pure hydrochloric acid in conjunction with the other elements of claim 1 is not disclosed or taught by *De Nobel* or the other prior art. There would be no reason why these advantages would be obvious to one of skill in the art at the time this application was filed, and no reason why such a person would not simply follow the teaching of *De Nobel* to use relatively dilute HCl solutions, or no acid at all.

As claims 2-9 and 11-13 depend either directly or indirectly on claim 1, simply adding limitations thereto, they also cannot be anticipated by *De Nobel* or the prior art in general, and withdrawal of the 35 U.S.C. § 102 rejection based on claims 1-4, 7-8, and 11 is respectfully urged.

Rejection of claims 5-6 and 8-9 Under 35 U.S.C. § 103 (a)

Claims 5-6 and 8-9 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *De Nobel* in view of *Janik et al.* (“Ohmic contacts to p-type cadmium telluride and cadmium mercury telluride”, *Journal of Physics*, Vol. 16, pp. 2333-2340, 1983), a reference that was discussed in the background portion of the present application (Application, paras. 15-16). This rejection is respectfully traversed.

Claims 5-6 and 8-9 are indirectly dependent on independent claim 1, which is patentable for the reasons described above. The arguments above are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Claim 5 has been amended, and requires that the semiconducting material or compound “is chemically etched in a solution comprising hydrochloric acid.” The Office Action contends that *De Nobel* “does not expressly teach chemical etching to prepare the surface of the II-VI semiconducting material or the surface of the compound of the II-VI semiconducting material before depositing the at least one electrode. However, Janik et al teaches chemical etching to prepare the surface to prepare the surface of the II-VI semiconducting material before depositing the at least one electrode.” (Office Action, p. 5.)

Janik discloses etching with a solution of “Br₂/CH₃OH” (bromine and methanol) (p. 2333). However, no mention in *Janik* is made of using bromine or any other substance in

hydrochloric acid or pure hydrochloric acid. No combination of *De Nobel* and *Janik* would lead one of skill in the art to use the method of claim 5, including the use of etching in hydrochloric acid.

As set forth in the present Application, the use of HCl is qualitatively and unexpectedly different than the use of methanol (CH_3OH) as disclosed in *Janik*. For example, Br_2/HCl etching may be used in the presence of photoresists, which makes it possible to have a chemical etching which is limited to surfaces intended for contact (Application, para. 0052). Furthermore, the Application states, “the surface tension of [solutions such as bromine-methanol] . . . is such that it allows the use of drops of these solutions and therefore chemical etches and coatings which are limited to the surfaces intended for contact. These operations are unachievable with the Br-methanol mixture . . .” (para. 55.) Moreover, unlike bromine-methanol, the application points out that “chlorine is used as a dopant in semiconducting materials” (para. 56) and that chlorine retains its aggressivity much longer than a Br-methanol solution (para. 58). Thus, the inventions of claim 5 would therefore not be obvious to one skilled in the art, in view of *De Nobel* and *Janik*, or any combination of the two references.

With respect to claims 6 and 9, the Examiner states that “bromine in pure hydrochloric acid is known etchant for etching the II-VI semiconducting material. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair*.” However, for all the reasons discussed above with respect to claim 5, the use of a Br_2/HCl etchant in conjunction with the other limitations of claims 6 and 9 is not obvious given the qualitatively and unexpectedly different results for Br_2/HCl in comparison to the bromine-methanol etchant solution disclosed in *Janik*. Moreover, since claims 5 and 8 are patentable, so are claims 6 and 9 which depend on them, respectively and inherit all their limitations.

Therefore, for the above reasons, claims 5-6 and 8-9 are patentable and not obvious in view of *De Nobel* and/or *Janik*, and withdrawal of the rejection under 35 U.S.C. § 103(a) is therefore requested.

Newly-Added Claims

Claims 14-15 have been added to further particularly point out and distinctly claim the subject matter regarded as the invention. Claims 14 and 15 do not add new subject matter. See, e.g., paragraph 0045 of the application as filed.

Conclusion

In view of the preceding discussion, Applicants respectfully urge that the claims of the present application define patentable subject matter and should be passed to allowance.

If the Examiner believes that a telephone call would help advance prosecution of the present invention, the Examiner is kindly invited to call the undersigned attorney at the number below.

Please charge any additional required fees, including those necessary to obtain extensions of time to render timely the filing of the instant Amendment and/or Reply to Office Action, or credit any overpayment not otherwise credited, to our deposit account no. 50-4181.

Respectfully submitted,
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Dated: 011/24/2008

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